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13. ABSTRACT (Maximum 200 words)

This is the final report summarizing the efforts performed under the grant "Analysis, Synthesis and Processing of Fractal Signals using Wavelets". This report includes a cummulative list of theses, conference presentations, and journal articles that have been supported either all or in part by the grant. Copies of the full texts have been sent to the program manager as they were written.

Detailed work has been reported in the parent grant entitled "Signal Analysis, Synthesis and Processing Using Fractals and Wavelets", Grant Number AFOSR-91-0034-C.

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Final Report

Analysis, Synthesis and Processing of

Fractal Signals Using Wavelets

September 1, 1992 – August 31, 1995

Research Organization: Digital Signal Processing Group
Research Laboratory of Electronics
Massachusetts Institute of Technology

Principal Investigator: Alan V. Oppenheim
Distinguished Professor of Electrical Engineering

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During the period October 1, 1993 through September 30, 1994 the grant supported the doctoral research of Michael Richard. This research was completed during this period and a doctoral thesis entitled "Estimation and Detection With Chaotic Systems" was submitted to and accepted by the Department of Electrical Engineering and Computer Science at MIT. Copies of the full text of the thesis and resulting Technical Report have been sent to the program manager.

In addition to the support of the research mentioned above, the grant funding has provided support for the doctoral research of Andrew Singer on "Signal Processing and Communication with Solitons". Andrew Singer's doctoral thesis is expected to be completed and submitted to the Department of Electrical Engineering and Computer Science at MIT in December 1995.

The grant funding has also provided support for one semester for the graduate research of Andrew Halberstadt. It is anticipated that Mr. Halberstadt will complete his graduate program in December 1998.

Publications in Reviewed Journals

[1] Gregory W. Wornell, Andrew C. Singer and Alan V. Oppenheim, "Nonlinear Autoregressive Modeling and Estimation in the Presence of Noise," in *Digital Signal Processing*, Vol. 4, pp. 207-221, November 1994.

Conference Proceedings

[1] A.C. Singer, "A New Circuit for Communication Using Solitons," *1995 IEEE Workshop on Nonlinear Signal and Image Processing*, (Neos Marmaras, Halkidiki) Greece, June 1995.

[2] A.K. Halberstadt, "Application of frequency-domain polyphase filtering to quadrature sampling," *SPIE's 1995 Annual Meeting and International*

Symposium on Optics, Imaging, and Instrumentation, July 9-14, 1995, (San Diego) CA.

[3] Andrew C. Singer, "Signaling Techniques Using Solitons," *IEEE International Conference on Acoustics, Speech, and Signal Processing*, Vol. 2, pp. 1336-1339, (Detroit) MI, May 1995.

[4] M.D. Richard, "Discrimination and Estimation with Chaos," *IEEE International Conference on Acoustics, Speech, and Signal Processing*, Vol. 3, pp. 141-144, (Minneapolis) MN, April 1993.

[5] M.D. Richard, "State Estimation with Chaotic Maps," *IEEE 1992 Digital Signal Processing Workshop*, pp. 8.2.1-8.2.2, (Starved Rock), IL, September 1992.

Talks

[1] M.D. Richard, "Chaos and Signal Processing," presented at *SIAM Conference on Applications of Dynamical Systems*, October 15-19, 1992, (Snowbird), UT; *SPIE's 1993 Annual Meeting and International Symposium on Optics, Imaging, and Instrumentation*, July 11-16, 1993, (San Diego), CA.

Thesis

[1] M.D. Richard, "Estimation and Detection with Chaotic Systems," Ph.D. Thesis, Massachusetts Institute of Technology, 1994.

Technical Report

[1] M.D. Richard, "Estimation and Detection with Chaotic Systems," RLE Tech. Rep. 581, M.I.T., Cambridge, MA, Feb. 1994.

To Appear

[1] A.C. Singer, "Detection and Estimation of Soliton Signals,", to be presented at *IEEE International Conference on Acoustics, Speech, and Signal Processing*, (Atlanta) GA, May 7-10, 1996.

[2] A.C. Singer, "Signal Processing and Communication with Solitons," Ph.D. Thesis, Massachusetts Institute of Technology, Dec. 1995.